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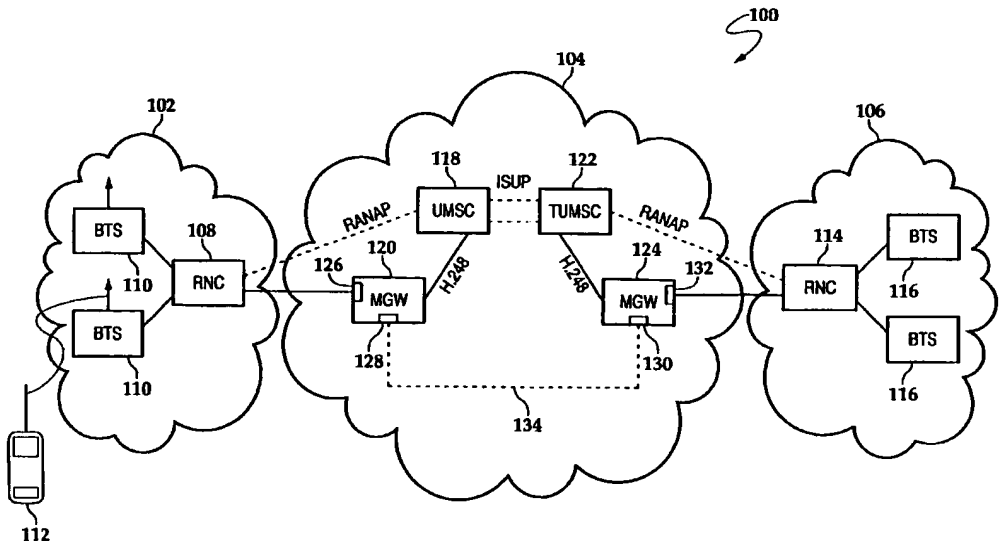
(54) Title: SYSTEM FOR MEDIA GATEWAY TO MEDIA GATEWAY ADDRESS INFORMATION EXCHANGE



(57) Abstract: A method and protocol for providing direct, per-call address information exchange (216, 218) between two distinct IP media gateways, including establishment of a first termination point (128) in an originating media gateway (120), transferring address information for the first termination point (204, 206, 214) to a receiving media gateway (124), establishing (220) of a second termination point (130) in the receiving media gateway, and using the address information to establish direct communication between the first and second termination points.

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SYSTEM FOR MEDIA GATEWAY TO MEDIA GATEWAY ADDRESS INFORMATION EXCHANGE

FIELD OF THE INVENTION

The present invention relates generally to packet switched communications networks and, in particular, to a system for exchanging address information between media gateways in a packet switched network.

BACKGROUND OF THE INVENTION

The usage of, and demand for, mobile telecommunications continue to increase at a staggering rate. Wireless telecommunications service providers are constantly seeking new ways to improve and expand the services they provide while lowering their investment and operational costs. This ever-increasing demand has driven the development of new and improved topologies and protocols for wireless communications systems. It is now possible to route voice communications, in packetized form, over Internet Protocol (IP) systems conventionally associated with computer data communications. Such capabilities hold the promise of increasing efficiency and decreasing costs associated with wireless communications.

Interest grows in IP-based communications as an alternative to conventional circuit switched systems. Circuit switched systems require dedicated channels, reserving an ISUP (ISDN user part) link for any given communication. Therefore, any given call effectively monopolizes a line (e.g., trunk or E1/T1 line) between call origin and destination, requiring a separate line for each call processed. Even in conventional "wireless" communications systems, a call is generally only wireless between the mobile unit and its closest base station, which thereafter typically routes the call on circuit switched infrastructure. For example, in a typical GSM (Global System for Mobile communications) network, once a signal is received at the base station, it is thereafter routed via circuit switched infrastructure to the mobile switching center (MSC) and the rest of the GSM system.

It should thus easily be appreciated that as demand continues to increase, infrastructure associated with circuit switched systems must increase correspondingly.

This results in increased system overhead, reduced call volume bandwidth, and increased user costs to cover the additional overhead.

In comparison, IP communications packetize voice data for transmission over existing IP networks; enabling users to communicate (e.g., via phone calls or computer-based conferencing applications) as long as they want for only the cost of the access to the IP network. IP infrastructure is ubiquitous; and use of IP infrastructure is not dedicated (i.e., multiple users utilize, one packet at a time, the same resources), lowering system overhead and use costs.

Although IP network communication is, in some respects, advantageous over circuit switched communication, other considerations limit the commercial usefulness of conventional IP network implementations. Consider, for example, a wireless communications system where communications between two disparate radio access networks are transferred across an IP based network. Usually, each radio access network will interact with a media gateway in the IP network that serves as an interface to the IP network. Conventionally in such topologies there is no protocol or capability for direct address information exchange between the media gateways on a per-call basis. This usually results in superfluous exchanges between other wireless infrastructure (e.g., ATM based transfers between MSCs) that degrade the efficiency and quality of communication.

SUMMARY OF THE INVENTION

From the foregoing, it can be appreciated that a need exists for providing an efficient and cost-effective IP network communication in wireless telecommunication applications. It is desirable that such a system provide structure and methods by which one media gateway can directly exchange address information with another media gateway on a per-call basis; overcoming the limitations of conventional systems.

The present invention provides a system for direct, IP-based connection and communication exchange between two separate media gateways, without relying on intervention or relay by other infrastructure elements. The present invention provides a process by which two media gateways may be configured for direct address

exchange. The present invention further provides a novel, IP-based protocol for media gateway to media gateway address exchange.

More specifically, the present invention provides a method and a protocol for providing direct, per-call information exchange between two distinct IP media gateways, including establishment of a first termination point in the originating media gateway, transfer of address information for the first termination point to a receiving media gateway, establishment of a second termination point in the receiving media gateway, and using the address information to establish direct communication between the first and second termination points.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the features and advantages of the present invention, reference is now made to the detailed description of the invention along with the accompanying figures in which corresponding numerals in the different figures refer to corresponding parts and in which:

FIGURE 1 is an illustrative diagram of one embodiment of a communications network configured according to the present invention; and

FIGURE 2 is an illustrative sequence diagram depicting certain communications of the network of Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

While the making and the use of the present invention are discussed in detail below, it should be appreciated that the present invention provides many applicable inventive concepts which can be embodied in a wide variety of specific contexts. The specific embodiments discussed herein are merely illustrative of specific ways to make and use the invention, and do not delimit the scope of the invention.

The present invention defines a system providing direct, IP-based connection and communication exchange between two separate media gateways without relying on intervention or relay by other communications structures. The present invention provides efficient and cost effective Internet Protocol (IP) network-based communication.

It should be understood that the principles and applications disclosed herein can be applied to a wide range of wireless telecommunications systems where direct communication across an IP network between two or more media gateways is desired. The teachings of this disclosure may be applied in adapting a variety of system topologies and protocols.

As previously described, IP networks may present wireless telecommunications providers and users with a number of advantages over conventional circuit switched networks. Circuit switched systems require dedicated channels (e.g., trunks), resulting in greater system overhead, reduced volume bandwidth, and increased user costs (to cover the additional overhead). Circuit switched networks require enormous investment in infrastructure to provide ability to secure dedicated lines for every call. By way of comparison, IP network systems packetize voice data over existing IP networks, enabling users to call or video-conference as long as they want for only the cost of the access to the IP network. IP infrastructure is ubiquitous, and use of IP infrastructure is not dedicated, lowering the associated overhead and use costs (i.e., multiple users are utilizing, one packet at a time, the same resources). Although it holds the potential for much greater efficiency, IP network communication service has not proven to be as reliable as circuit-switched communication, and therefore is still not widely utilized.

The present invention provides a new protocol between media gateways (MGWs) for direct exchange of address information on a per call basis. In each MGW, a termination point (TP) will be reserved on the IP network side. For transmission of speech information over the IP link, all MGWs will comprehend the others' IP addresses and, to distinguish between different calls, also the UDP port number used on each side for a specific call.

For purposes of illustration and explanation, a universal mobile telephony system (UMTS) mobile to mobile call scenario will be used to describe specific aspects of the present invention. Referring now to Figure 1, one embodiment of a communications network 100 according to the present invention is illustrated. Network 100 comprises a first access network 102 (e.g., an ATM-based radio access

network), an IP-based core network 104, and a second access network 106, of similar or different configuration and topology as network 102.

Network 102 may comprise a radio network controller (RNC) 108 communicatively coupled to one or more base telephony stations (BTS) 110. Each BTS 110 may have one or more mobile subscriber units (i.e., a cell phone) 112 communicatively associated therewith. For purposes of illustration and explanation, network 102 and unit 112 will hereafter be assumed as call origination.

Network 106 may comprise a radio network controller (RNC) 114 communicatively coupled to one or more BTS 116. Each BTS 116 may have one or more mobile subscriber units (not shown) communicatively associated herewith. For purposes of illustration and explanation, network 106 will hereafter be assumed as call destination or termination.

Network 104 may comprise a universal MCS (UMSC) 118 and a media gateway (MGW) 120, communicatively coupled to one another (e.g., via H.248), and associated and communicatively coupled with network 102. UMSC 118 is a call control server which is performing both ISUP signaling, as well as signaling toward network 102 using, for example, a Radio Access Network Application (RANAP) protocol. Network 104 may also comprise a terminating UMSC (TUMSC) 122 and a MGW 124, communicatively coupled to one another (e.g., via H.248), and associated and communicatively coupled with terminating network 106. UMSC 118 and TUMSC 122 are also communicatively coupled together (e.g., via ISUP).

In order to establish direct communication between MGWs 120 and 124 (establishing the communications link, over IP, between unit 112 and a receiver in network 106), a bearer must be established between the two. Network 100 must decide whether there is, or will be, a two-way communication path between the MGWs. UMSC 118 first establishes a communications link between networks 102 and 104 by initiating a termination point (TP) 126 (TP1) in MGW 120 associated with RNC 108. Next, two-way communication between MGWs 120 and 124 is established. UMSC 118 next issues, for example, an ADD command to MGW 120 in order to establish a second TP 128 (TP2). MGW 120 responds with an ACCEPT

message communicating address information, and any applicable UDP information, associated with TP 128.

UMSC 118 communicates this address information to TUMSC 122 (via ISUP). TUMSC 122 issues an ADD command to MGW 124, establishing a third TP 130 (TP3) and communicating the address information associated with TP 128. Additionally, TUMSC 122 establishes a communications link between networks 104 and 106 by initiating a fourth termination point (TP) 132 (TP4) in MGW 124 associated with RNC 114, before issuing the ADD command for TP 130. MGW 124, now having the address and UDP information associated with TP 128, may send communication directly to TP 128 containing the address and UDP information associated with TP 130, establishing a direct, call-specific communication link 134 between MGWs 120 and 132. Once this 'bearer' link is established, IP based communication between the MGWs requires no intervention from the other elements of system 100.

Figure 2 provides a diagram 200 further illustrating the message flow of a portion of the UMTS mobile to mobile call scenario depicted in Figure 1. The IP address and UDP port number for the TP 128 in MGW 120 is requested by UMSC 118 in a Gateway Control Protocol (GCP) ADD command 202, and sent from MGW 120 to UMSC 118 in a response (ACCEPT message) 204. The received address information is sent in the forward direction to TUMSC 122 in an Initial Address Message (IAM) 206. TUMSC 122 sends a SETUP message 208 towards a receiving mobile in network 106, which sends back a CONFIRM message 210 containing information necessary for proper selection of MGW 124. TUMSC 122 processes this information and selects 212 MGW 124. TUMSC 122 sends the received information to MGW 124 in another ADD command 214, with the instruction to MGW 122 to send its address information over IP to MGW 120 (i.e., TP 128). This instruction may be accomplished using a SETUP parameter in the ADD command (e.g., as is done in the ATM case to request the setup of an AAL2 connection from MGW 124 to MGW 120). After MGW 124 sends 216 the address information associated with TP 130, and MGW 120 confirms 218 receipt back to MGW 124, MGW 124 sends an ACCEPT message 220 back to TUMSC 122 finalizing the establishment of TP 130.

A direct, IP-based bearer link 134 is established between MGWs 120 and 124 for the call in question.

The address information exchange from MGW 124 to MGW 120 can be done using UDP as a transport protocol. In that case two messages may be utilized. The first message 216 will send the address information from MGW 124 to MGW 120. This message may be called IP Establish Request (IPER) or some other suitable name. This message will at least include the IP address and UDP port number for both MGW 120 and MGW 124. The second message 218 will respond from MGW 120 confirming reception of the IPER message 216. This message may be called IP Establish Confirm (IPEC) or some other suitable name. If TCP is used as the transport protocol, only IPER message 216 is utilized, since TCP has a confirmation mechanism.

The embodiments and examples set forth herein are presented to best explain the present invention and its practical application and to thereby enable those skilled in the art to make and utilize the invention. However, those skilled in the art will recognize that the foregoing description and examples have been presented for the purpose of illustration and example only. For example, although the present invention has been described herein within the context of a UMTS wireless telecommunications network, the present invention may be implemented in any of a number of different telecommunications systems. The description as set forth is not intended to be exhaustive or to limit the invention to the precise form disclosed. Many modifications and variations are possible in light of the above teaching without departing from the spirit and scope of the following claims.

WHAT IS CLAIMED IS:

1. A packet based communications protocol comprising:

establishment of a first termination point in a first media gateway;

establishment of a second termination point in a second media gateway; and

exchange of address information directly between the first and second termination points.

2. The protocol of Claim 1 wherein the establishment of the first termination point further comprises issuance of a command from a call control server to the first media gateway for information associated with the address of the first termination point.

3. The protocol of Claim 2 wherein the establishment of the first termination point further comprises issuance of a response containing the information associated with the address of the first termination point from the first media gateway to the call control server.

4. The protocol of Claim 3 wherein the establishment of a second termination point further comprises transfer of the information associated with the address of the first termination point from the call control server to a second call control server.

5. The protocol of Claim 4 wherein the establishment of a second termination point further comprises selection of the second media gateway by the second call control server.

6. The protocol of Claim 5 wherein the establishment of a second termination point further comprises issuance of a command from the second call control server for the second media gateway to send information associated with the address of the second termination point directly to the first termination point.

7. The protocol of Claim 6 wherein the exchange of address information directly between the first and second termination points further comprises issuance of a message from the second media gateway to the first termination point containing information associated with the address of the second termination point.

8. The protocol of Claim 7 wherein the exchange of address information directly between the first and second termination points further comprises issuance of a response from the first media gateway confirming the message from the second media gateway.

9. The protocol of Claim 8 wherein the issuance of a command from a call control server to the first media gateway for information associated with the address of the first termination point further comprises the issuance of an ADD message.

10. The protocol of Claim 8 wherein the issuance of a response containing the information associated with the address of the first termination point from the first media gateway to the call control server further comprises the issuance of an ACCEPT message.

11. The protocol of Claim 8 wherein the transfer of the information associated with the address of the first termination point from the call control server to a second call control server further comprises communication via ISUP.

12. The protocol of Claim 8 wherein the issuance of a command from the second call control server for the second media gateway to send information associated with the address of the second termination point directly to the first termination point further comprises the issuance of an ADD message.

13. A method of providing direct, per-call information exchange between two distinct media gateways, comprising the steps of:

establishing of a first termination point in a first media gateway;

transferring address information for the first termination point to a second media gateway;

establishing of a second termination point in the second media gateway; and

using the address information to establish direct communication between the first and second termination points.

14. The method of Claim 13 wherein establishing the first termination point further comprises issuing a command from a call control server to the first media gateway for information associated with the address of the first termination point.

15. The method of Claim 14 wherein establishing the first termination point further comprises issuing a response containing the information associated with the address of the first termination point from the first media gateway to the call control server.

16. The method of Claim 15 wherein transferring address information for the first termination point to a second media gateway further comprises transferring the information associated with the address of the first termination point from the call control server to a second call control server.

17. The method of Claim 16 wherein establishing of a second termination point further comprises selecting the second media gateway by the second call control server.

18. The method of Claim 17 wherein establishing a second termination point further comprises issuing a command from the second call control server for the second media gateway to send information associated with the address of the second termination point directly to the first termination point.

19. The method of Claim 18 wherein the using of the address information to establish direct communication between the first and second termination points further comprises issuing a message from the second media gateway to the first termination point containing information associated with the address of the second termination point.

20. A wireless communications system comprising:

an Internet Protocol based core network;

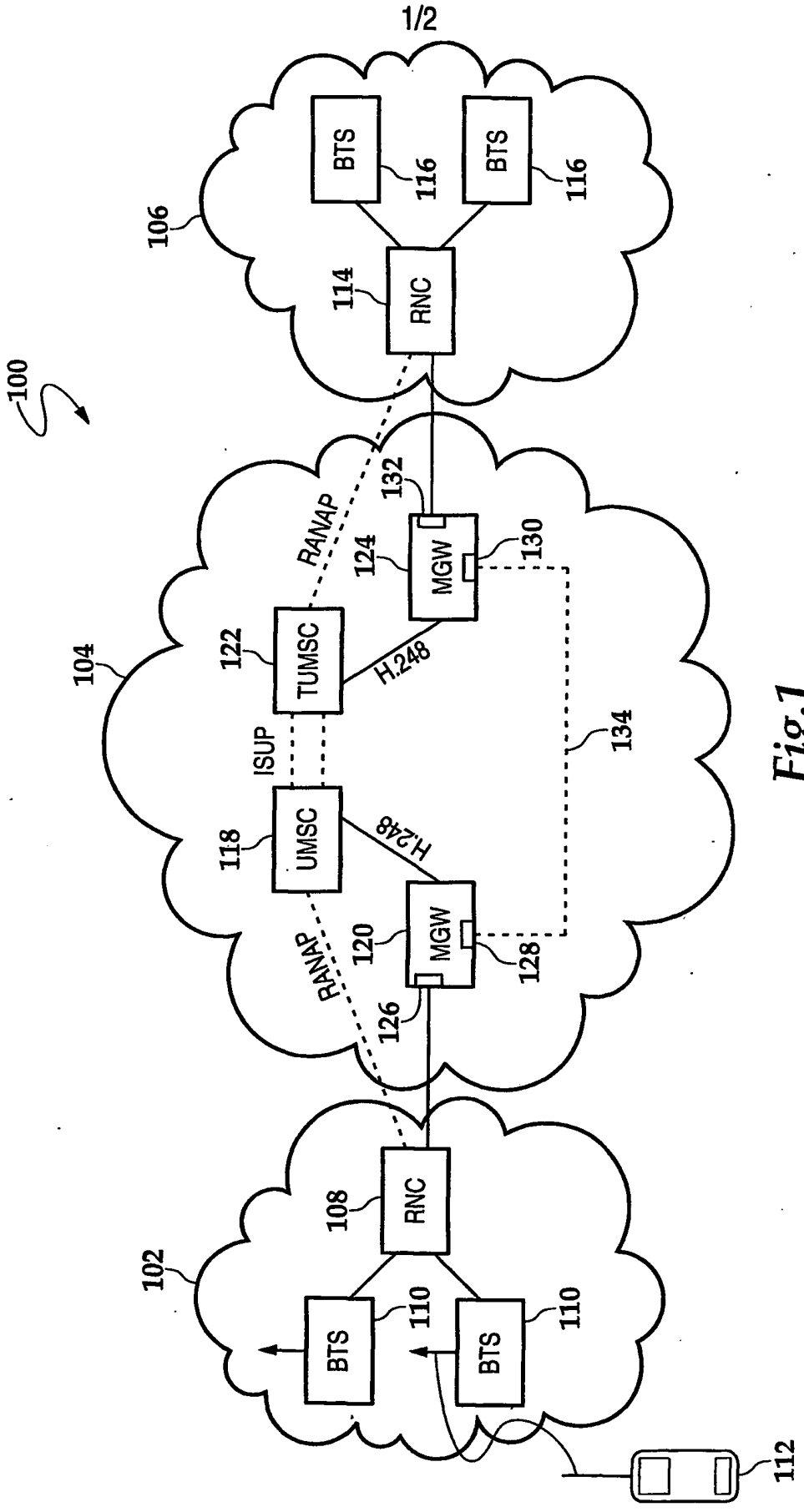
a first access network;

a second access network;

a first gateway in the core network, communicatively associated with the first access network;

a second gateway in the core network, communicatively associated with the second access network;

wherein the first and second gateways are adapted to directly exchange address information on a per-call basis.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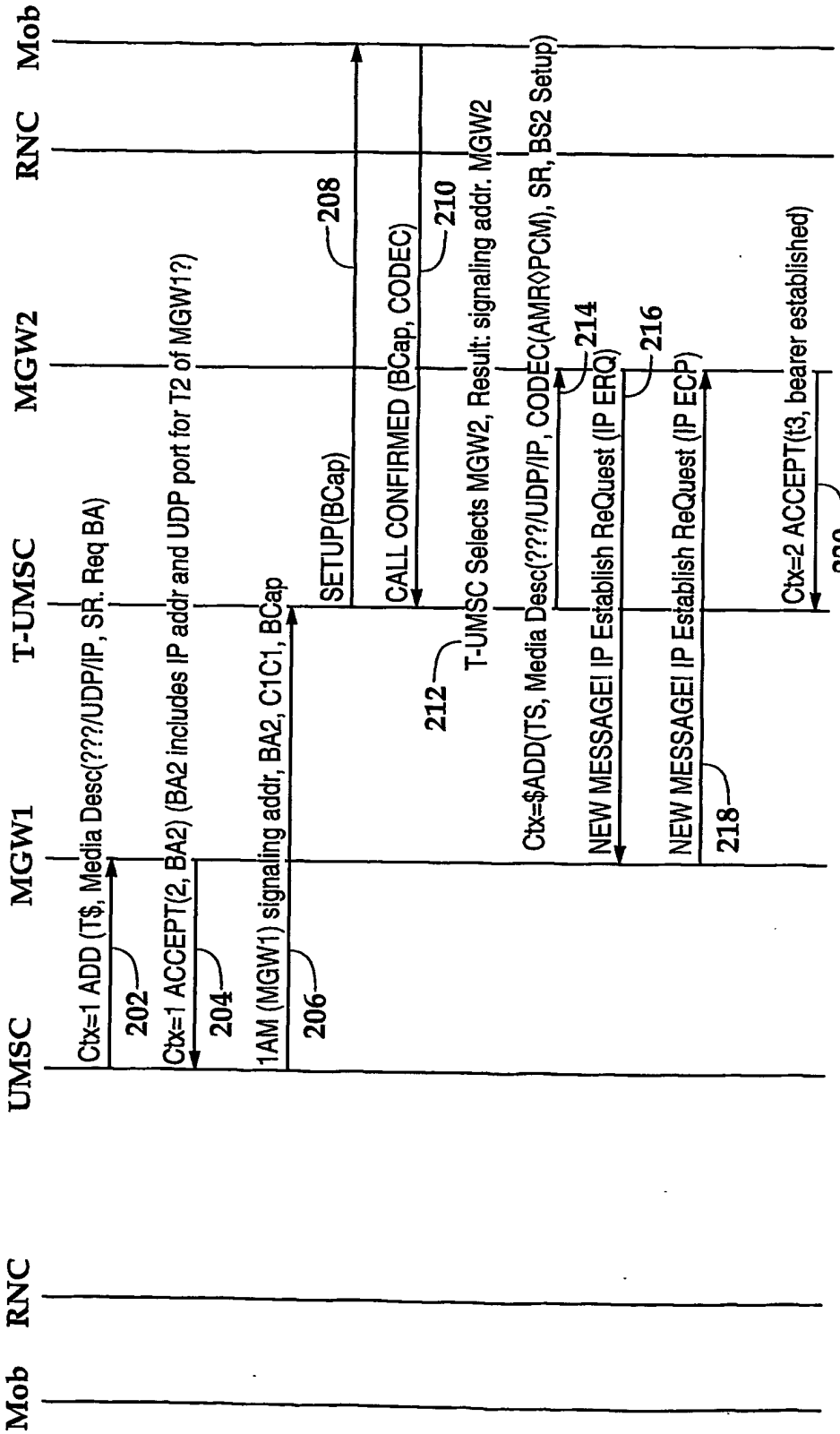
MGW
MGW
TUMSC
UMSC
RANAP
RANAP
H.248
H.248
ISUP

Fig.1


Mob
RNC
UMSC
MGW1
T-UMSC
MGW2
RNC
Mob
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202
Ctx=1 ACCEPT(2, BA2) (BA2 includes IP addr and UDP port for T2 of MGW1?)
204
1AM (MGW1) signaling addr, BA2, C1C1, BCap
206
SETUP(BCap)
208
CALL CONFIRMED (BCap, CODEC)
210
212
T-UMSC Selects MGW2, Result: signaling addr. MGW2
Ctx=$ADD(TS, Media Desc(???/UDP/IP, CODEC(AMR◊PCM), SR, BS2 Setup)
214
NEW MESSAGE! IP Establish ReQuest (IP ERQ)
216
NEW MESSAGE! IP Establish ReQuest (IP ECP)
218
Ctx=2 ACCEPT(t3, bearer established)
220
200

Fig.2